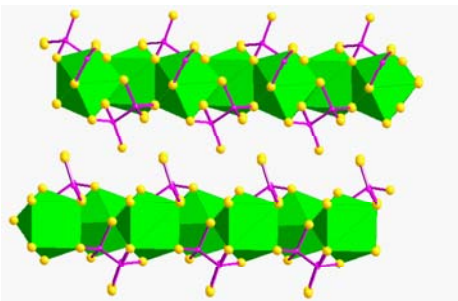
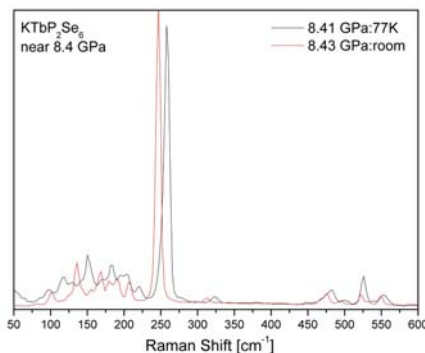
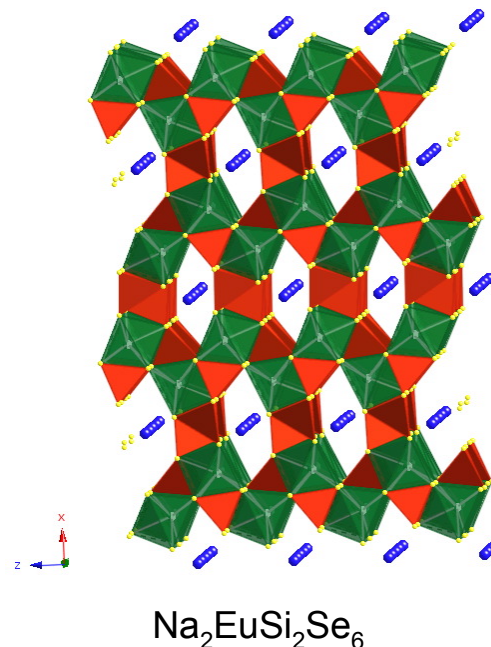


Study of Structure-Physical Properties Relation of New Materials with Reduced Dimensionality I

Hans Dieter Hochheimer & Peter K. Dorhout, Colorado State University, DMR-0091639

We are studying the effects of pressure on low-dimensional materials. Extreme pressures can create new materials by causing shifts in electron density that cannot be made under ordinary chemical synthetic conditions. Low-dimensional compounds such as layered or tunnel structures can undergo dramatic shifting of electrons so as to create new bonds. Our KTbP_2Se_6 layered phase, below, will change color and structure as high pressures or low temperatures are applied yielding a new three-dimensional channeled compound. These changes can be monitored by vibrational spectroscopy – a unique tool to study the motion of atoms.

New phases such as luminescent $\text{Na}_2\text{EuSi}_2\text{Se}_6$ have been prepared that will undergo high pressure studies this year to test the effects of pressure on their phosphorescence.



KTbP_2Se_6

Our interdisciplinary chemistry and physics research team probes the fundamental electronic behavior of materials under extreme conditions to simulate the physical control of chemical reactions.

Study of Structure-Physical Properties Relation of New Materials with Reduced Dimensionality II

Hans Dieter Hochheimer & Peter K. Dorhout, Colorado State University, DMR
0091639

Brief summary of outreach activities:

Educational:

1 undergraduate,
1 REU supplement undergraduate
3 grad students,
1 post-doc.

Courses taught this year by the PIs include solid state physics, solid state chemistry, general physics, advanced inorganic synthesis laboratory, structural methods of analysis. The low-dimensional $\text{Ti}_x\text{V}_6\text{S}_8$ was prepared by an undergraduate student interested in the physics of charge-density wave materials. Our joint project in materials combines students and faculty in an interdisciplinary team focused on the fundamental chemistry and physics of materials.

